FORM PTO-1390 (REV. 5-93)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER **10917/11**
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/581408

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATES CLAIMED
PCT/DE98/03536	**(02.12.98) 02 December 1998**	**(11.12.97) 11 December 1997**

TITLE OF INVENTION
METHOD FOR RECOGNIZING SPEECH USING A GRAMMAR

APPLICANT(S) FOR DO/EO/US
CLASS, Fritz and KILIAN, Ute

Applicants herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) immediately rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment. (together with two sheets of amended Figs. 1-3 and 5)
    ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: International Search Report and English Translation thereof; Translation of International Preliminary Examination Report; two (2) sheets of drawings; first page of published International Application WO 99/30314.

EXPRESS MAIL NO. : EL234411650US

U.S. APPLICATION NO. if known, see 37 C.F.R.1.5	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/581408	PCT/DE98/03536	10917/11

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO $840.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) . . . $670.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) $760.00		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO $970.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) $96.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 840.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	10 - 20 =	0	X $18.00		
Independent Claims	1 - 3 =	0	X $78.00		
Multiple dependent claim(s) (if applicable)			+ $260.00		
TOTAL OF ABOVE CALCULATIONS =				$ 840.00	
Reduction by ½ for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				$	
SUBTOTAL =				$ 840.00	
Processing fee of $130.00 for furnishing the English translation later the ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$ 840.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$ 40.00	
TOTAL FEES ENCLOSED =				$ 880.00	
				Amount to be: refunded	$
				charged	$

a. ☐ A check in the amount of $_____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account No. 11-0600 in the amount of **$880.00** to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-0600. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

R. L. Mayer

SIGNATURE

Kenyon & Kenyon
One Broadway
New York, New York 10004

Richard L. Mayer, Reg. No. 22,490
NAME

June 12, 2000
DATE

[10917/11]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: CLASS, ET AL.

SERIAL NO.: to be assigned

FILED: herewith

TITLE: METHOD FOR VOICE RECOGNITION USING A GRAMMAR

ART UNIT: not yet known

EXAMINER: not yet known

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

PRELIMINARY AMENDMENT

Please amend the above-identified application before a first consideration on the merits as follows:

IN THE DRAWINGS:

Please replace Figs. 1-3 and Fig. 5 with the amended Figs. 1-3 and 5 submitted herewith.

IN THE SPECIFICATION:

On page 1, delete line 1.

On page 1, before line 2, insert --Field of the Invention--.

On page 1, before line 5, insert --Related Technology--.

On page 1, line 15, after "Patent No. 195 01 599 C1", insert--, which is hereby incorporated by reference herein,--.

On page 2, after line 5, insert -- A combination of linguistic detection models with phrase grammars and N-gram detection models in one language model is described in a publication of Meteer et al.: "Statistical Language Modeling Combining N-Gram and Context-Free Grammars," Speech Processing, Minneapolis, April 27-30, 1993, Vol. 2, pp. II-

37 to II-40, XP000427719, IEEE.

A publication of Kenji Kita: "Incorporating LR Parsing into Sphinx," ICASSP 91, Speech Processing 1, Toronto, May 14-18, 1991, Vol. 1, pp. 269-272, XP000245219, IEEE, describes a speech detection method that begins with a context-free grammar. If the parser can find a result with the context-free grammar, the digram grammar is not used. If a syntactically correct result is not present, a changeover is made to the digram grammar.--

On page 2, before line 6, insert --Summary of the Invention--.

On page 2, line 6, change "the object" to --an object--.

On page 2, delete lines 9 and 10.

On page 2, before line 11, insert --The present invention provides a method for recognizing speech from word sequences assembled from multiple words of a given vocabulary, in which a first recognition method and a second recognition method are provided. A first recognition method and a second recognition method are applied to separate segments of a word sequence that is to be recognized. A recognition method with integrated unique syntax is applied as the first method and a recognition method with statistical word sequence evaluation is applied as the second recognition method. Upon a change from the digram recognition method with integrated unique syntax to the second recognition method with statistical word sequence evaluation, the last two words of the segment processed using the first method are combined into one pseudoword that is processed using a digram detection method.--.

On page 2, line 15, delete "What is".

On page 2, line 16, change "essential about the combination is that" to --According to the present invention,--.

On page 4, before line 8, insert ---Brief Description of the Drawings--.

On page 4, line 9, delete "to preferred exemplary embodiments referring".

On page 4, line 17, after "example", insert --based--.

On page 4, before line 19, insert --Detailed Description--.

On page 4, line 20, change "Figures" to --drawings--.

IN THE ABSTRACT:

On line 1, change "The invention relates to a" to --A--, and change "bigram" to --digram--.

IN THE CLAIMS:

Please cancel without prejudice original claims 1-10, the substitute claims 1-6 annexed to the International Preliminary Examination Report, and add new claims 11-20 as follows:

11. (new) A method for recognizing speech from a word sequence, the method comprising:

applying a first recognition procedure to a first segment of the word sequence, the first segment including a plurality of first words;

applying a second recognition procedure to a second segment of the word sequence, the second segment including a plurality of second words;

combining a last two words of the plurality of first words into a pseudoword upon a change from the first recognition procedure to the second recognition procedure; and

processing the pseudoword using a digram detection method.

12. (new) The method as recited in claim 11 wherein the first recognition procedure includes an integrated unique syntax procedure and the second recognition procedure includes a statistical word sequence procedure.

13. (new) The method as recited in claim 12 wherein the first recognition procedure is a digram recognition procedure and the second recognition procedure is a trigram recognition procedure and wherein the second recognition procedure limits permissible series of second words in the second segment according to a statistical evaluation.

14. (new) The method as recited in claim 12 wherein at least one of the first and second segments is predefined in terms of at least one of a respective segment length and segment position.

15. (new) The method as recited in claim 14 wherein at least one of the first and second segments is permanently allocated to one of the first and the second recognition procedure.

16. (new) The method as recited in claim 15 wherein the first segment has a predefined length and is positioned at a beginning of the word sequence.

17. (new) The method as recited in claim 12 wherein the second segment has a predefined length and is positioned at a beginning of the word sequence.

18. (new) The method as recited in claim 13 wherein the applying the second recognition procedure includes:

recognizing a word triplet, the word triplet including three second words of the plurality of second words; and

representing the word triplet as a pseudoword doublet, the pseudoword doublet including a second and a third pseudoword, the second pseudoword overlapping with the third pseudoword and each of the second and third pseudowords including two of the three second words of the word triplet.

19. (new) The method as recited in claim 12 wherein a change from the second recognition procedure to the first recognition procedure is performed based on a respective word detection or phrase detection.

20. (new) The method as recited in claim 19 wherein the second recognition procedure is used as standard.

REMARKS

This Preliminary Amendment cancels without prejudice original claims 1-10 and the substitute claims 1-6 annexed to the International Preliminary Examination Report in the underlying PCT Application No. PCT/DE98/03536 (a translation of which is submitted herewith), and adds new claims 11-20. The new claims do not add new matter to the application but do conform the claims to U.S. Patent and Trademark Office rules.

The amendments to the specification, drawings, and abstract are also to conform the specification and abstract to U.S. Patent and Trademark Office rules. It is respectfully submitted that the amendments to the specification, drawings, and abstract also do not introduce new matter into the application.

The underlying PCT application includes a Search Report, a copy of which is also submitted herewith.

Conclusion

Consideration of the present application as amended is hereby respectfully requested.

Respectfully Submitted,

Kenyon & Kenyon

Dated: 6/12/00

Richard L. Mayer (Reg. No. 22,490)
One Broadway
New York, NY 10004
(212) 425-7200 (tel.)
(212) 425-5288 (fax)

METHOD FOR RECOGNIZING SPEECH USING A GRAMMAR

Description

The present invention relates to a method for recognizing speech from word sequences assembled from multiple words of a given vocabulary.

The error rate for recognition of continuously spoken speech that permits any desired combination of all words rises considerably by comparison with individual word recognition. To counteract this, knowledge about permissible word sequences is stored in so-called language models, and used during recognition in order to reduce the number of word sequences.

Language models are usually defined as so-called N-gram models, N designating the depth of the model; in other words, N successive words within a word sequence are taken into account during the current evaluation. Because the complexity of the recognition process rapidly rises with increasing values of N, digram (N = 2) and trigram (N = 3) language models are the ones principally used.

German Patent No. 195 01 599 C1 describes, in addition to various previously known methods for speech recognition, a method that allows the storage in a digram language model of phrases having fixed syntax and any desired length N. The method integrates knowledge about the syntax of permitted phrases (word sequences) into the language model, and is therefore also referred to as a "syntactic digram." An essential element for integrating syntax into the language model is the indexing of words that occur more than once in different phrase constellations. As a result, the speech recognition system is identical with and without integrated syntax.

With the severe limitation of the permissible word sequences and a limited number of permitted phrases, the speech recognition system operating according to the syntactic digram language model achieves a high recognition rate but is also usable only if syntactic limitations can be reliably defined and adhered to, for example in the case of short commands, date or time inputs, and the like. If the number of

permitted word sequences is large, however, complete definition of the syntax is very laborious; and in situations where spontaneously formulated word sequences also need to be recognized, and in which there is no guarantee that syntactic limitations will be observed, recognition using a strictly syntactic language model is of only limited suitability.

It is therefore the object of the present invention to describe a method for recognizing speech that offers an expanded area of application compared to existing methods, with a good recognition rate.

The present invention is described in Claim 1. The dependent claims contain advantageous embodiments and developments of the present invention.

The combined utilization of two different recognition methods, in particular having different degrees of syntactic limitation, preferably of recognition methods based on a language model with unique syntax on the one hand, and of a statistical N-gram language model on the other hand, results, surprisingly, in a considerably expanded area of application, yielding a variety of possible combinations. What is essential about the combination is that successive word sequence segments of a cohesive word sequence are processed using different recognition methods. Depending on the area of application, a different division of the overall word sequence into segments, and use of the various recognition methods, may be advantageous. In this context here and hereinafter, what is meant as "words" is not only words in the linguistic sense as sound sequences having a demonstrable conceptual content; "words" are rather to be understood in general as sound sequences processed integrally in the speech recognition system, for example including the speaking of individual letters, syllables, or syllable sequences without a specific conceptual assignment.

When a word sequence is divided into one or more segments, it is possible in particular to predefine at least one segment in terms of position and/or length. A predefined segment of this kind can be positioned, in particular, at the beginning of a word sequence, and can also have a fixed length in terms of the number of words that it encompasses. Advantageously, the recognition method with the integrated unique syntax can then be allocated to this segment. Because of the limited length of the segment, the outlay in terms of syntax definition and processing using the recognition

method with integrated unique syntax remains within acceptable limits. At the same time, the number of plausible word sequences can be considerably limited because the syntax is defined and is taken into account in the first segment. One advantageous field of application of this is the input of concepts by spelling. For example it is possible to recognize several tens of thousands of different city names by spelled-out speech input, with a surprisingly high recognition rate and little outlay, by combining an initial segment of fixed length that is processed on the basis of a recognition method with integrated unique syntax, and further processing of the speech input following that segment using a statistical N-gram recognition method, in particularly a digram or trigram recognition method. If exclusively a recognition method with integrated unique syntax were used, the outlay for syntax integration and process would greatly exceed tolerable limits. On the other, the exclusive use of a statistical language model in such cases would yield inadequate recognition rates.

Other advantageous examples of the segment-wise utilization of a recognition method with integrated unique syntax include word sequences with date or time information, whose word environment can then advantageously be processed with a statistical language model.

It is particularly advantageous if a statistical language model is combined with a language model with integrated syntax limitation even for the recognition of word sequences in which recurrent characteristic terms or phrases can be expected. In this context, the statistical recognition method is preferably used as the standard procedure; and if the word flow is monitored in a manner known per se for specific terms or phrases ("word spotting" or "phrase spotting"), it is possible, when such terms or phrases are detected, to initiate a segment in which speech recognition is performed using the detection method with integrated unique syntax. This segment can possess a fixed or variable length, which in particular can also be adapted to the respective term or phrase. After the completion of this segment, if the word sequence continues, it is then possible to change back to the standard recognition method with statistical word sequence evaluation.

For the recognition method with integrated unique syntax, it is preferable to use the syntactic digram recognition method known from the existing art cited initially. For the statistical speech recognition method with word sequence

evaluation, a digram recognition method is then also advantageous for application of an integral speech recognition system. On the other hand, a statistical recognition method with a higher value of N yields an improved detection rate, but also requires greater processing outlay. An advantageous compromise is to use a trigram recognition method for the statistical recognition method; a preferred embodiment of the present invention provides for performing recognition with the information volume of a trigram recognition method, in the form of digram processing.

The present invention is illustrated in even further detail below with reference to preferred exemplary embodiments referring to the drawings, in which:

Figure 1 shows a simple processing sequence diagram using the example of a spelled-out speech input;

Figure 2 shows a network graph according to the existing art;

Figure 3 shows the graph of Figure 2 with additional syntactic limitation;

Figure 4 shows the beginning of the graph of Figure 3 utilizing the present invention; and

Figure 5 shows an expanded example on the principle of Figure 4.

The example selected for explanation of the present invention with reference to the Figures is spelled-out speech input of city names. The lexicon of a spelling recognition system to be used for this purpose comprises approximately 30 letters as well as a few additional words such as "double" or "dash." The list of city names contains, for example, several tens of thousands of entries, so that complete storage of the unique syntactic information (in this case the letter sequences) would increase the magnitude of the lexicon containing the syntactic information, and the computing time required for recognition, to unacceptable levels.

The sequence diagram sketched in Figure 1 for the recognition of a spelled-out entry with no parameters of any kind indicates, by way of the arrows, that proceeding from a Start node, the word sequence (which, in the particular example selected, is a sequence of individually pronounced letter names) can begin with any one of the letters provided for, and any letter can be followed by any other letter unless the word sequence has already ended, as represented by the End node.

In the conventional network graph depiction, network paths are shown, for example, for the German city names Aachen, Aalen, and Amberg. As set forth in German Patent No. 195 01 599 C1 already cited as existing art, in a network graph of this kind the identical word nodes (letters) occurring at various positions of the network yield not only the plausible word sequences provided for by the network paths, but also in a plurality of nonsense word sequences that nevertheless qualify as permissible according to the language model.

To eliminate this problem, German Patent No. 195 01 599 C1 proposes to use indexing in order to distinguish those word nodes which occur more than once in the network. Indexing makes all the word nodes of the network unique, and for each word node it is possible to indicate completely, as the syntax describing the totality of all permissible word sequences, the permissible subsequent word nodes. Especially in the case of spelled-out input of terms from a long list of terms, the ambiguity of the network graph without indexing is enormous.

Based on the example of Figure 3, Figure 4 depicts the procedure according to the present invention. What is selected, for purposes of illustration, is a variant of the present invention in which at the beginning of the word sequence, a segment of constant predefined length is processed using a recognition method with unique syntax integration, and a changeover is then made to a statistical recognition method with word sequence evaluation. The basis for the recognition method with unique syntactic limitation is a syntactic digram recognition method. The length of the introductory segment at the beginning of the word sequence is assumed to be $k = 3$ words. It is assumed for the subsequent segment of the word sequence, whose length is a priori not known or limited, that a statistical recognition method with word sequence evaluation, and with the information depth of a trigram method, will be used. In order to illustrate a particularly preferred embodiment of the present invention, a description will also be given of processing of the trigram information using a digram recognition method, by the fact that the information volume of three words (word triplet) present inside the trigram window is divided into two overlapping pseudowords (word doublet) that each comprise a combination of two successive words of the underlying trigram window.

In the example sketched in Figure 4, proceeding from the Start node, at the

beginning of a word sequence a syntactic digram recognition method is applied in a manner known from the existing art. For the city names entered in Figures 2 and 3 as network paths:

AACHEN

AALEN

AMBERG,

this means that the first three individually spoken letters

A A C

A A L

A M B

are processed with the syntactic digram recognition method. For processing of the subsequent word sequence segment using a trigram recognition method, it is advantageous if the information from the first segment can also already be evaluated as history for the beginning of the second segment. For processing with the information depth of a trigram, this means that the letter sequences

A C H E N

A L E N

M B E R G

of the information should advantageously be available with trigram information depth. The processing in the second segment of the word sequence entered in spelled-out fashion therefore advantageously also includes the last two letters of the first segment.

It is particularly advantageous if the same speech recognition system can be used in all successive segments. For this purpose, in the second segment the information present with trigram information depth is now processed using a digram recognition method. This is done by reshaping the word triplet of the trigram window, which is shifted stepwise sliding fashion along the word sequence, into a pseudoword doublet in which each two adjacent words of the word triplet of the trigram window are combined into one pseudoword. For the examples selected, the result is thus a sequence of pseudowords of the following type:

AC CH HE EN

AL LE EN

MB BE ER RG,

in which each two successive pseudowords (letter pair) contain the speech information of a word triplet from one trigram window. Reshaping the word triplets into pseudoword doublets makes possible digram processing, which takes into account only two successive pseudowords in each case, while retaining the trigram information depth. Because digram processing is used in the second segment as well, the design of the speech recognition system remains the same over the entire word sequence.

For the transition from the first segment with processing based on a syntactic digram recognition method to the second segment with processing based on the pseudoword digram recognition method without syntactic limitation, it is advantageous if, in the first segment, the last word node has added to it the information of the previous word node; this results, in the first segment, in a sequence of word nodes (letters) of the following kind:

A A AC

A A AL

A M MB;

the last word node once again constitutes a pseudoword with the information of the previous node.

Figures 5 depicts a portion, configured using this principle, of the network graph for the examples also selected in Figures 2 and 3. Proceeding from a Start node, in the first segment the network is built up with individual word nodes (individual letters) which then, at the transition to the second segment, transition into pseudoword nodes each having the information volume of two successive letters. The transitions between the pseudoword nodes are evaluated, in a manner known per se, on the basis of learning samples. The resulting network graph comprises a combination of the two different recognition methods. Despite the considerably greater number of distinguishable pseudowords as compared to the number of different letters, dispensing with continuous application of a syntactic limitation over the entire network results in a considerable reduction in processing outlay, with a high recognition rate.

In the example of Figure 5, arrows from each of the pseudoword nodes to the

End node indicate that even after only a portion of the entire word sequence, the speech input may already be sufficient for allocation of a term from the predefined list. In a recognition system, this can be implemented by the fact that once the number of terms considered relevant after input of a portion of the word sequence has been sufficiently limited, the recognition system offers a selection of terms (on a display, for example) so that input can thereby be shortened.

The present invention is not limited to the exemplary embodiments described, but rather can be modified in various ways in the context of the capabilities of one skilled in the art. In particular, the degree to which syntactic information is taken into account in the second method is variable.

Claims

1. A method for recognizing speech from word sequences assembled from multiple words of a given vocabulary, in which a first recognition method and a second recognition method are provided for application to separate segments of a word sequence that is to be recognized.

2. The method as defined in Claim 1, characterized in that the first recognition method is a recognition method with integrated unique syntax.

3. The method as defined in one of Claims 1 through 4 **[sic]**, characterized in that the first method is a digram recognition method with integrated unique syntax.

4. The method as defined in one of Claims 1 through 3, characterized in that the second recognition method is a recognition method with statistical word sequence evaluation.

5. The method as defined in Claim 4,
characterized in that the second method is a trigram recognition method in which the permissible word sequences are limited by way of a purely statistical evaluation.

6. The method as defined in Claim 5, characterized in that the word triplet of the trigram window is represented as a pseudoword doublet, the two pseudowords of a doublet overlapping and each containing two words of the corresponding triplet.

7. The method as defined in Claim 6,
characterized in that upon a change from the first recognition method with integrated unique syntax to the second recognition method with statistical word sequence evaluation, the last two words of the segment processed using the first method are combined into one pseudoword.

8. The method as defined in one of Claims 1 through 7, characterized in that at least one segment is predefined in terms of its position and/or its length, and is permanently allocated to one of the alternative recognition methods.

9. The method as defined in Claim 8,
characterized in that a segment of predefined length at the beginning of the phrase is processed using the first recognition method with integrated syntax.

10. The method as defined in one of Claims 1 through 8, characterized in that the second recognition method without integrated syntax is utilized as standard, and a changeover to the first recognition method with integrated syntax is made on the basis of word detection (word spotting) or phrase detection (phrase spotting).

Abstract

The invention relates to a method for voice recognition, wherein a bigram method with integrated unequivocal syntax restriction is combined with an N-gram voice model with statistical word sequence evaluation in such a way that alternative recognition methods can be used in different segments of a word sequence.

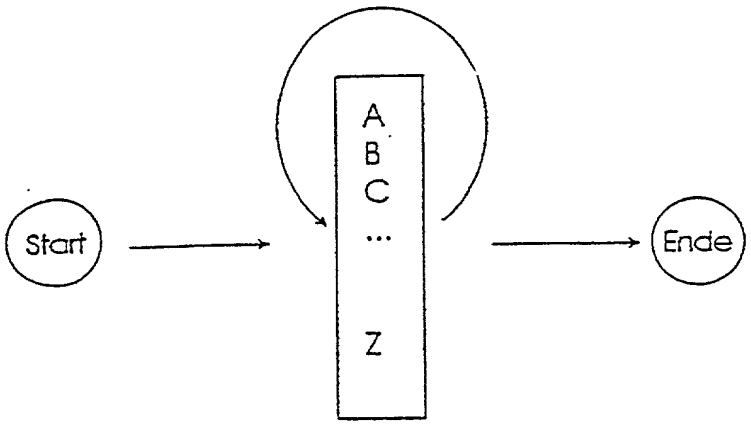

Fig. 1

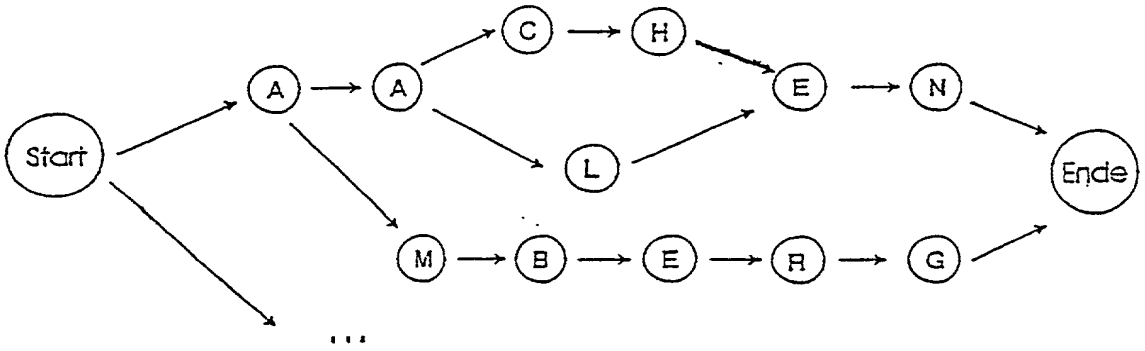

Fig. 2

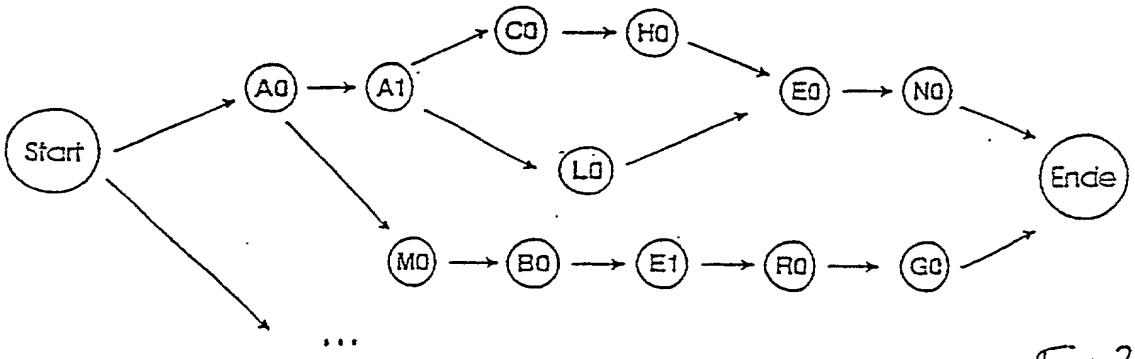

Fig. 3

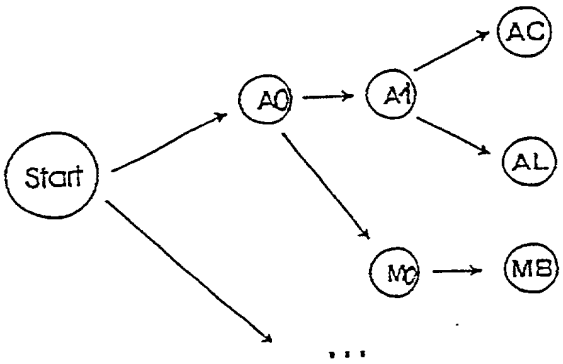
Start
A0
A1
AC
AL
M0
MB
...

Fig. 4

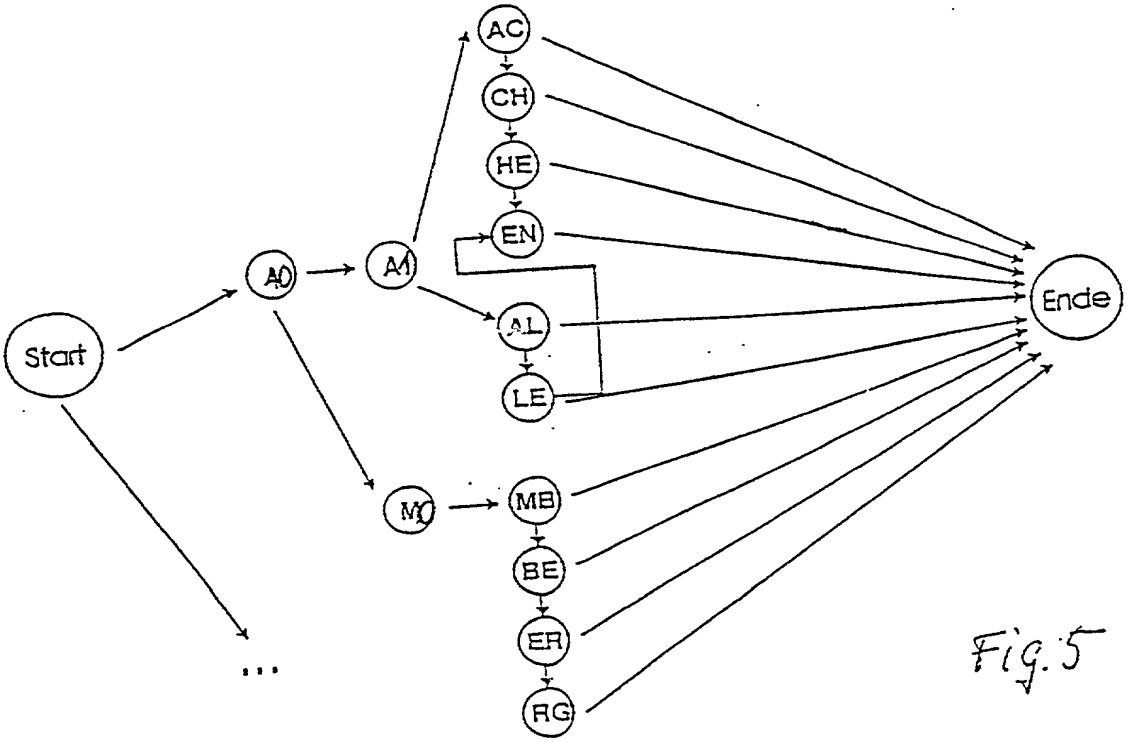
Start
A0
A1
AC
CH
HE
EN
AL
LE
M0
MB
BE
ER
RG
Ende
...

Fig. 5

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	
DECLARATION AND POWER OF ATTORNEY	ATTORNEY'S DOCKET NO 10917/11

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am an original, first, and joint inventor of the subject matter that is claimed and for which a patent is sought on the invention entitled **METHOD FOR VOICE RECOGNITION USING A GRAMMAR,** the specification of which was filed as International Application No. **PCT/DE98/03536** on **2 December 1998**.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

PRIOR FOREIGN APPLICATION(S)

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S C. § 119
Germany	**197 54 957.8**	**11 December 1997**		**YES**

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys:
Richard L. Mayer (Reg. No. 22,490)
Erik R. Swanson (Reg. No. 40,833)

SEND CORRESPONDENCE, AND DIRECT TELEPHONE CALLS TO:

Richard L. Mayer
KENYON & KENYON
One Broadway
New York, New York 10004
(212) 425-7200 (phone)
(212) 425-5288 (facsimile)

EL234411650US

I declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code and that such willful statements may jeopardize the validity of the application or any patent issuing thereon.

FULL NAME OF INVENTOR	FAMILY NAME **CLASS**	FIRST GIVEN NAME **Fritz**	SECOND GIVEN NAME
RESIDENCE & CITIZENSHIP	CITY & ZIP CODE **D-72587 Zainingen**	STATE OR FOREIGN COUNTRY **Germany** DEX	COUNTRY OF CITIZENSHIP **Germany**
POST OFFICE ADDRESS	POST OFFICE ADDRESS **Nelkenweg 7**	CITY & ZIP CODE **D-72587 Zainingen**	STATE OR FOREIGN COUNTRY **Germany**
Signature	Fritz Class	Date	05/08/00
FULL NAME OF INVENTOR	FAMILY NAME **KILIAN**	FIRST GIVEN NAME **Ute**	SECOND GIVEN NAME
RESIDENCE & CITIZENSHIP	CITY & ZIP CODE **D-89081 Ulm**	STATE OR FOREIGN COUNTRY **Germany** DEX	COUNTRY OF CITIZENSHIP **Germany**
POST OFFICE ADDRESS	POST OFFICE ADDRESS **Dornstadter Weg 4**	CITY & ZIP CODE **D-89081 Ulm**	STATE OR FOREIGN COUNTRY **Germany**
Signature	Ute Kilian	Date	05/11/00